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Research Report

Left: Dr. Ooraikul; right, Mr. Iwabuchi.

Next: synthetic potato skins

Alberta scientists design a high-tech spud

"Hold the fries!" is the plea of an ever-increasing number of health-conscious Canadians. Food service managers like Michael Foley of the Edmonton-based Alberta division of Versa Services which supplies 70 institutional food outlets in the province, admits the demand for French Fries is on the decline "because people are more cautious about what they eat." And the stereotypical greasy French Fry just doesn't fit the bill. But despite their dietary leanings, a society of working spouses demands something quick and easy like prepackaged fries, which almost one-third of Alberta's 212,000 tonne potato production is turned into annually.

And Dr. Buncha Ooraikul, associate professor of food science at the University of Alberta and J.K. "Jack" Iwabuchi, president of I&S Produce Ltd. of Edmonton, say they've found the answer: an "instant baked potato." They envision a semi-artificial tuber, created by developing a process of stuffing a synthetic potato skin with real mashed potato, freezing it and marketing it. The concept was developed with the help of a $127,000 grant from Alberta Agriculture's Farming For The Future program. And last month, the United States Department of Commerce, Patent and Trademark office in Washington, D.C., issued the developers patent #4582710 for their process of manufacturing a synthetic potato skin.

Dr. Ooraikul and Mr. Iwabuchi claim their creation—especially its synthetic coating—has many advantages over the real McCoy. "There's nothing in a potato skin except a little fibre," says Dr. Ooraikul, "and even that doesn't amount to much." And a real potato skin is often laden with green spots, caused by the production of two toxic glycoalkaloids "chaconine" and "solanine," that appear in the presence of sunlight or artificial lighting. "These substances are poisonous and potentially dangerous," says Dr. Ooraikul, "not unlike strychnine." In addition, consumers lose a good portion of their potatoes by having to cut away the affected parts, and producers discard a whopping 31,000 tonnes every year, mainly because of surface imperfections.

However, the developers think their instant product would remedy many industry ills. Superficially damaged potatoes and oddly shaped pieces that don't conform to the rigid needs of the French Fry trade could be mashed and used for stuffing. The synthetic potato skin itself packs a 20% protein punch, owing to its ingredients: wheat bran, animal protein and natural gelling agents. It has none of a real potato's imperfections (eyes, dirt, spots), and the unique technology that goes into making the skins can also be used in other applications, such as egg rolls and Chinese dumplings. "Of course," says Mr. Iwabuchi, "the instant baked potato will never replace home cooking." But with minimal preparation time required, extended shelf life and broad applications, the developers think the public might just grab hold of this hot potato.

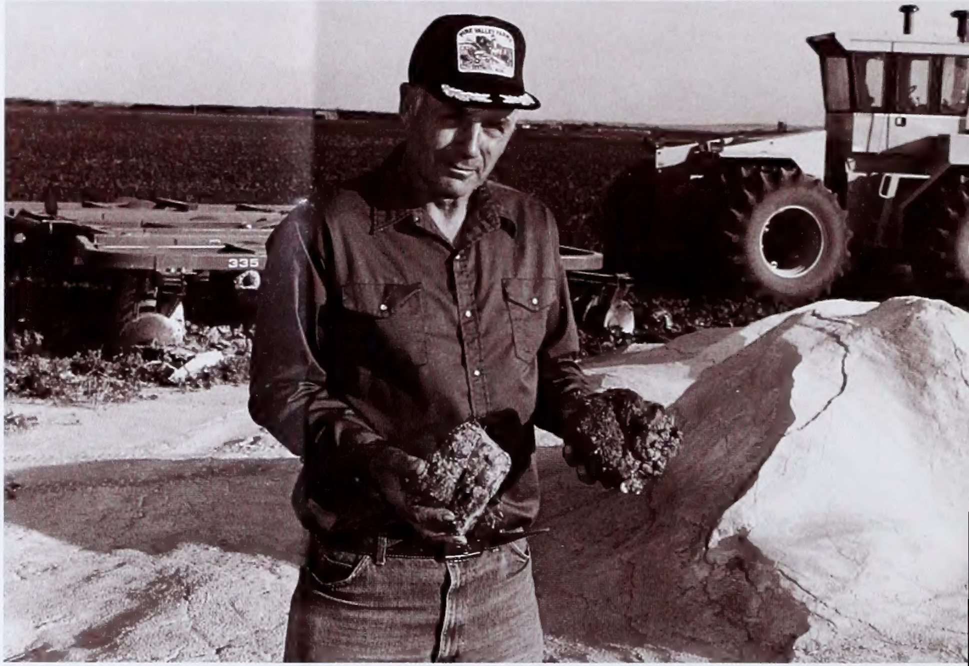
Gypsum makes it grow

Peace Country clay can be even more productive

Henry (Harry) Rowney, a farmer from Sexsmith (pop. 1,184), 135 kilometres southwest of Peace River, had always found his land difficult to cultivate. The problem, it seems, was that his soil—like 2.52 million other acres of Peace Country clay—belonged to the Solonetzic group, which contains high levels of sodium and makes the ground tough to work. So three years ago, he participated in a $7,805 Alberta Agriculture Farming For The Future "On-Farm Demonstration" program, aimed at improving soil quality. And now, he's convinced that the experiment was a success. "I can't really say too much about what is actually happening in the soil," he says, "but I can see that it works."

Solonetzic soil is created by the movement of clay particles that pile up on top of one another. "This stacking is like having two sheets of glass with a little water between them," says Garry Coy, the regional soils specialist at Fairview. "They're so adherent that they can't be pulled apart." When the pieces become hopelessly bound, a soil region called the "hardpan" is created. And in stopping root and water penetration into the deeper and less rigid layers of the soil, the hardpan level also becomes highly saturated with sodium (salt). That imbalance is devastating to farmers. "This soil is only manageable with certain amounts of moisture," says Mr. Coy. "In wet weather it becomes very thick, almost plastic-like. And when it's too dry, it becomes very hard and lumpy." Crop yields can fall 20% to 30% when the soil isn't just right.

So in the demonstration project, one of about 100 that Alberta Agriculture sponsors each year, Mr. Rowney and Mr. Coy concerned themselves with the moisture content of the soil and its sodium and



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Salt of the earth

Coming to grips with damaging saline seeps

Land in Alberta has many properties that a progressive farmer looks for. But unfortunately it's also burdened with unusually high levels of salt. Although most arable soil contains some amount of salt, the Great Plains of the United States and Canada are burdened with appreciably more than fields in eastern North America. And when this seeps into a common area, it spells disaster for the local crops. "The accumulation of soil salts is indeed a unique western problem," says Dr. M.J. "Jim" Hendry, head of the groundwater section of Alberta Agriculture's drainage branch. Dr. Hendry, who holds a Ph.D in hydrogeology, is currently involved in a study, supported by a $83,355 grant from Alberta Agriculture's "Farming For The Future" research program, entitled "Assessment of Saline Seep Control Measures."

Saline deposits appear because of the run-off of excess water and its subsequent evaporation (see accompanying diagram). The run-off water, from sources as varied as rain and snow accumulation and irrigation canal seepage, is left in the soil in the root zone after maximum absorption has taken place by the plants. It then flows downwards from where it entered the ground—called the "recharge area"—until it finds a low spot or depression in the land, and stops in what is referred to as the "discharge area." As it trickles along, it picks up naturally occurring salts. At the discharge site, the water evaporates, leaving behind the salts.

High concentrations of salt are poisonous to the plants. And the substance creates "osmotic pressure" on the root system, reducing the plant's ability to take in moisture. Farmers steer clear of obviously affected areas, thus reducing the amount of land available for cultivation and pasture.

So Dr. Hendry wants to try to reclaim the salt-riddled patches. For the most part, his experiments involve high moisture-use crops like alfalfa, and to a lesser degree, shallow tile drainage. According to his theory, the more water a plant draws in, the less there'll be to run-off to a low area in the field and create a problem. And the drainage system he's testing will lead from the "discharge site" and drain the saline-laden water before it evaporates. Such drainage systems now exist, and can cost a farmer $400 to $600. But Dr. Hendry is favouring neither, preferring instead to compare and contrast, and perhaps identify a superior reclamation method that utilizes them both.

Dr. Hendry has no plans to try to eradicate naturally occuring saline deposits. "Their causes are of an incredibly diverse nature," he says, "and therefore they're almost impossible to get rid of." However, he adds, "because we know what causes the other kinds of saline accumulations, we can do something about it through reclamation measures and a re-evaluation of certain management procedures." ◆

pH level. They planted Neepawa wheat, a high-quality bread wheat grown in most of the Peace Country, in five plots: a control plot with no alterations; a "subsoiled" or "ripped" plot, where the hardplan layer was mechanically broken up; a plot with limestone added; a subsoiled plot with limestone added; and a subsoiled plot with gypsum added.

The results, says Mr. Rowney, have been very encouraging. In the first year, in all plots where subsoiling was used the yields were consistently higher than the control plot. The best producer was the gypsum batch. In year two, all the treated plots out-yielded the control plot. They also experienced lower sodium levels, allowing some of the salt to be washed out of the immediate root zone. "Gypsum contains calcium sulphate which displaces the sodium and creates more space for water movement," says Mr. Coy. "The limestone contains calcium carbonate, which favourably raises the pH level." Indeed, by 1985, wheat yields in the subsoiled plots with gypsum added reached 57.2 bushels per acre, 20% higher than the control plot.

Project monitoring will continue until 1988, so the researchers have a wide data base to strengthen their conclusions. However, Mr. Rowney so firmly believes in what they've accomplished already that he's started treating one-third of his farm with limestone and gypsum. "These treatments," he says, "have made it so this soil can be successfully cultivated."

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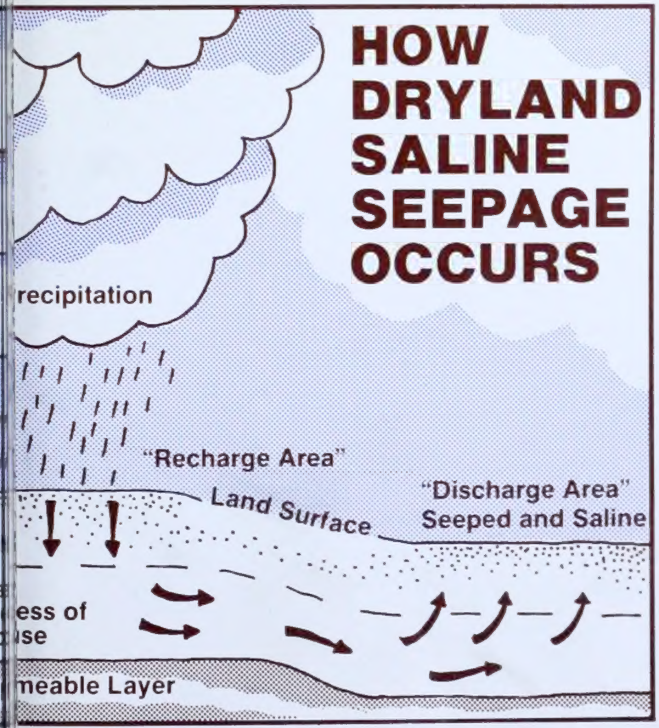
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FARMING FOR THE FUTURE

by Dr. Arthur O. Olson
Assistant Deputy Minister Research and Resource Development

Welcome to the first edition of Alberta Agriculture's *Research Report*. The very fact that you are reading this indicates that you are probably a farmer on the leading edge of productivity in this province. And you know that without technological advances such success would not be possible.

Some say there's a crisis in agriculture today. When I was in China in 1982 to explore new markets for Alberta farm products, one of our guides informed me that the Chinese pictogram for the word "crisis" consists of the signs for "danger" and "opportunity." It's probably always been that way at the leading edge. I believe that the present farm situation is an opportunity: farsighted agricultural producers must reduce input costs and accelerate the use of new research discoveries.

And that's the main purpose of *Research Report,* to expedite technology transfer from the laboratory to the field. In the past, research advances have taken up to 15 years to reach the producer. We just can't afford to wait that long anymore.

This month, *Research Report* features stories on a synthetic potato skin, saline seeps and some dangers associated with the total confinement livestock industry. It also explains how a Peace River farmer increased his grain production by utilizing technology gleaned through a $7,805 grant he'd received from the department's Farming For The Future program, a unique research funding project fuelled by the province's Heritage Savings Trust Fund. Its symbol, , suggests both a mature head of wheat and the microscopic double helix associated with DNA, the basic building block of life. All research and demonstrations supported by Farming For The Future have the goal of applying technology to improve the net farm incomes and long term viability of Alberta's agricultural community.

In coming editions, you'll read about breakthroughs in livestock vaccines, new seed varieties, farm implements and more. I hope you will find *Research Report* useful and informative. If you have any questions or suggestions on how it can be improved, please use the coupon on the back page to let us know.

Poison gas in your barn

Researchers outline a toxic threat

For almost 25 years, farmers have had the technology to raise animals in total confinement, to maximize production and decrease maintenance costs. But keeping swine and poultry in barns continually, produces certain deleterious side effects for man and beast alike, says J. Brian McQuitty, associate vice-president of facilities and professor of agricultural engineering at the University of Alberta. Funded by a $48,870 Alberta Agriculture Farming For The Future program grant, Mr. McQuitty has studied the air quality in barns, and found there could be serious health consequences. "Our two main concerns," he says, "are both lethal concentrations of gases, and the chronic exposure to lesser concentrations over longer periods of time."

Mr. McQuitty and his colleague John Feddes, an assistant professor of agricultural engineering at the university, conducted their studies between August 1984, and September 1985. They used two confinement barns, one a floor-rearing system and the other a cage-rearing system. The levels of free floating contaminants were measured by drawing air samples from as many as 15 locations in the barns with a vacuum pump, which then propelled the samples through plastic tubes to a mobile laboratory outside the structure.

Analysis revealed that the substances causing the most concern were ammonia, hydrogen sulphide and dust. According to Mr. McQuitty, "ammonia alone is not a big concern, but in the presence of dust there can be problems." The dust absorbs the substance, and is then inhaled by livestock or humans, eventually becoming trapped in the respiratory system and lung tissue. This causes an inflammation of the mucous membrane of the lung, reduced breathing capacity and a general pre deposition to illness. Furthermore, dust carries harmful bacteria and viruses. And finally, "clouds" of deadly, rotten egg-smelling hydrogen sulphide can be caused by disturbing manure piles. "Every year," says Mr. Feddes, "farmers die from this."

Researcher Feddes testing gaseous concentrations.

Having identified the presence of these substances, the researchers now point to the need for further study into the relationship with human illness—especially respiratory woes—and better methods of handling manure and venting confinement barns. "We have only been able to study and measure the levels of air contaminants in the last 10 to 15 years because the necessary equipment wasn't available before that," says Mr. McQuitty. "We know there are dangerous levels in barns, but we don't know what the safe levels are and new ventilation systems can't be designed until these are established." However, that isn't where the problems end. "Many farmers won't change their old practices until we can show them in dollars and cents that they're adversely affecting their livestock," says Mr. McQuitty, "or until we can give them viable alternatives. And we just don't have that type of information yet."

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